Assessment of Water System Complexity and Availability of Water Quality Data

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Scope & Definitions

- Safe Drinking Water Act regulated Community Water Systems (CWS)

- CWS is public or private entity serving 25+ people present for 6+ months/yr

- State primacy agency reports to Safe Drinking Water Information System (SDWIS)

What is Water Quality Data?

- Water quality data is routinely collected water sampling information to assist regulatory agencies in monitoring and enforcing water quality standards

- Since water quality standards were created to keep contaminants under a maximum concentration level (MCL), information about population-level exposures is not typically reportable, nor centralized

What is Water Quality Data?

- <u>Water Systems</u> (contracting labs) report <u>Water Samples</u> to state agency at permitted <u>Sampling Stations</u>

- Sampling Stations are commonly georeferenced and coordinates are reported, but …

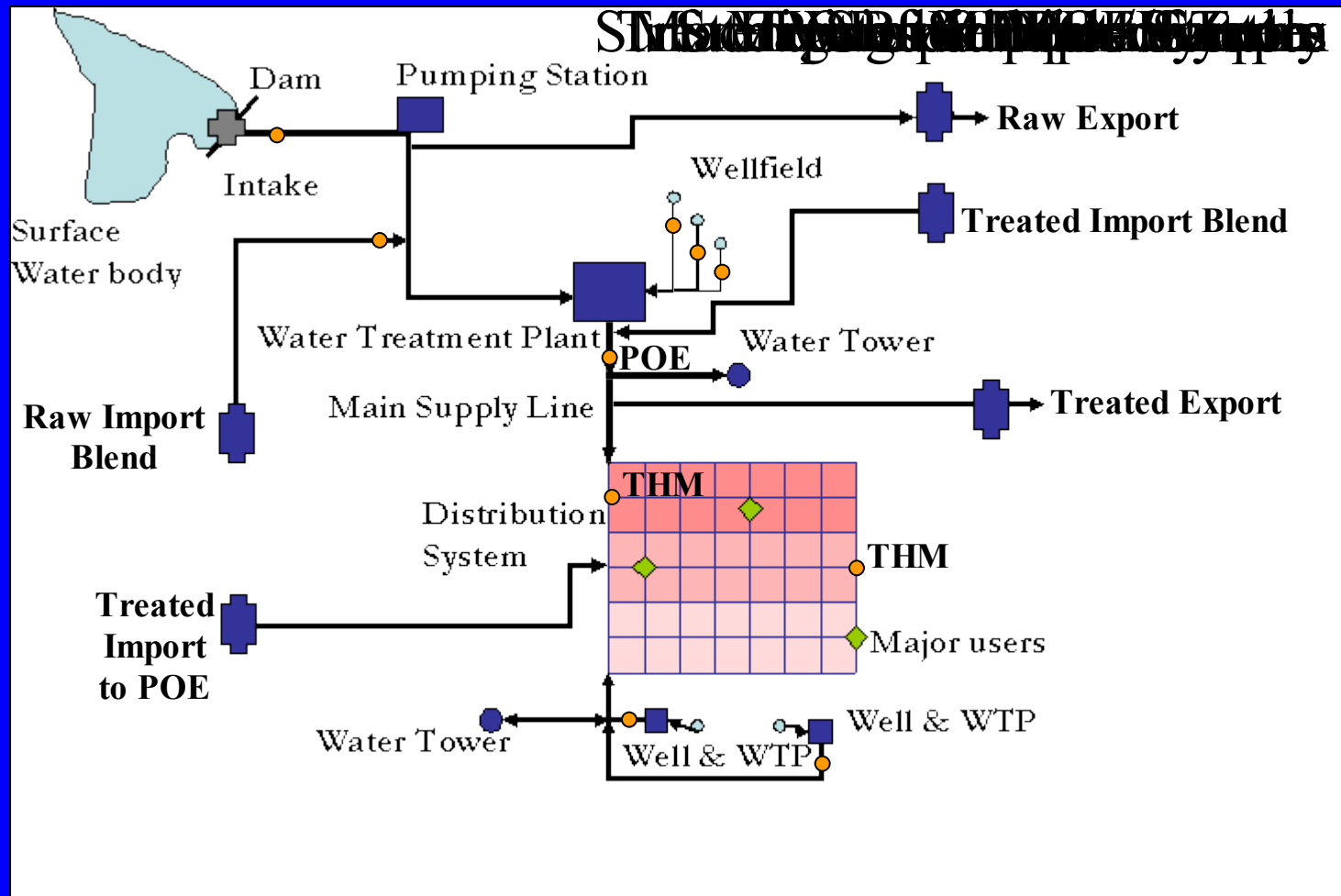- Some agencies maintain electronic boundaries for water systems, but…

Water "Exposure" Objectives

- Systematically link individuals or small populations to representative (spatial/temporal) water quality samples

- Adjust (model) and aggregate samples, if necessary, to reflect "tap" water quality at downstream receptor sites

Water Quality Data is not Exposure Data

- Proximity to a water sample does not always imply an exposure
  - Water quality data does not tell us where water flows after sampling
- Levels can change after sampling
  - Treatment and mixing

Degrees of Complexity

- Sampling stations
- Interties/Interconnections

Complexity Categories

1. Sources -- varying types, quality, and flow contributions

2. Changes due to treatment

3. Multiple points of entry

4. Intra/inter mixing at pressure zones

5. Chemical-specific reactions

6. Temporal variations

Water Purveyor Survey

- Identify simple systems for early tracking
- Provides info for assessing level of effort to handle more complex systems
- Incorporates SDWIS information/structure for efficient distribution, customized question/answer skip patterns
- Easy to answer (avoids station-specific detail)

Survey IT Infrastructure

- XML Schema describing question/answer patterns, reporting dbs, respondent-specific attributes, administrators

- Results reported to single or multiple repositories in standard structure

- AJAX for RPC allows survey to be hosted at multiple domains with custom look-and-feel and low installation/config overhead

Types of Sources

- SDWIS has type identifier for SW & GW, but not interties

- Question: What types of water sources are regularly used to supply your distribution system? Check all those that apply. (surface water, well/ground water, infiltration gallery, intertie/imported water, other____)

Mixing

- Existence and location of mixing not reported to SDWIS

- Question: Do you combine two or more sources of water having substantially different quality? (check all that apply)
  - Yes, before treatment
  - Yes, before point-of-entry to distribution system
  - Yes, after point-of-entry to distribution system
  - No

Source Contribution & Temporal Variation

- SDWIS provides no information on source flow contributions
- Question: Do you have records for the amount of water produced by each water source or imported at each intertie?
  - yes, on a daily basis
  - yes, on a monthly basis
  - yes, on a yearly basis
  - no
- if yes, are these records in electronic format?

Sources and Interties

- SDWIS does not provide residential-only, importer, or exporter system identifier

- Question: Do you currently provide water service directly to residential customers and/or do you currently export water to other water systems?

  - Only export water to other systems

  - Export water and provide water service to residential consumers

  - Do not export water and provide water service to residential consumers

Raw Water Importance

- EPA Standardized Monitoring Framework (SMF) emphasizes POE samples

- POE sample is most representative sample but infrequent when MCLs met

- CA analysis: >80% of "interesting" raw and untreated samples lacked info @ POE +/-1 yr

- Raw/source samples provide signals for short exposure periods and < MCL

Treatment Effects

- Important for adjusting raw samples and predicting DBPs

- Treatment types reported in state SDWIS

- Sampling stations are not linked to downstream treatment types

- Follow-up survey should establish station-specific sequence/connectivity to treatment locations

Points-of-Entry

- No definitive identifier in SDWIS
- Most representative sample before distribution system; 1 POE is <u>very</u> simple
- Question: How many points-of-entry (POE) are supplying your distribution system? A point-of-entry is where water is added or introduced to your distribution system. It can be from an intertie, a single source, or blended sources, such as from a wellfield.

    <u>   </u>number of POEs

Pressure Zones

- Not captured in SDWIS
- Could be homogeneous water quality zone
- Could have isolated connectivity to POE
- Question: Are there distinct pressure zones within your distribution system ? (yes or no).
  - If yes, how many? ___
  - If yes, do you have electronic files showing the boundary of pressure zones? (yes or no)
    - If yes, check all that apply (GIS, CAD, Other ____)
    - If no, do you have paper drawings/maps of your pressure zones? (yes or no)

Reactions

- THM formation during chlorination and distribution (storage)

- Volatilization

- Distribution samples are well-identified in SDWIS

- Connectivity to POE established in follow-up survey

Linkage of Populations to Systems

- No complete and accurate spatial coverage of water system extents in SDWIS
- Question: Do you have electronic files showing the customer service area boundary of your distribution system? (yes or no)
  - If yes, check all that apply (GIS, CAD, Other____)
  - If no, do you have paper drawings/maps of the boundary of the distribution system?

- Complication: boundaries change/time
- Complication: private domestic sources exist within system boundaries

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Next Steps

- Complete white paper by October '06
- Integration with Content Workgroup
- Refinement, pilot and deployment of survey

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